Institutional Control Monitoring Report

for the

Naval Reactors Facility

Waste Area Group 8

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Prepared for the
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ABSTRACT

This Institutional Control Monitoring Report assesses the effectiveness of Institutional Controls (ICs) being implemented at the Naval Reactors Facility in accordance with two past Records of Decision (RODs) and as described in the Institutional Control Plan (Appendix D of the Phase II Remedial Action Work Plan for Operable Unit (OU) 8-08). ICs preserve the underlying assumptions of Remedial Investigation/Feasibility Studies developed for Waste Area Group (WAG) 8 that will protect human health and the environment. The ICs are selected remedies for 'No Further Action' sites, and are part of the selected remedies for the NRF Inactive Landfill Areas (OU 8-05 and 8-06) and for radiological (OU 8-08) sites.

ICs specified in the WAG 8 RODs assume that NRF remains under Federal Government Control for at least 100 years following completion of the RODs. The ICs include visible access restrictions and procedures to control activities and unauthorized access.

1.0 Purpose

The purpose of this Institutional Control Monitoring Report (ICMR) is to assess the adequacy of Institutional Controls (ICs) implemented for various Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at Waste Area Group (WAG) 8 at the Idaho National Laboratory (INL). The Naval Reactors Facility (NRF) has been identified as WAG 8 by the Federal Facility Agreement and Consent Order (FFA/CO). In May 1999, the Environmental Protection Agency (EPA) Region 10 issued the final policy on the use of ICs at Federal Facilities. As part of that policy, an Institutional Control Monitoring Report was requested to be completed annually. Useful information is also contained in a fact sheet issued by the U.S. EPA entitled "Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, EPA 540-F-00-005, OSWER 9355.0-74FS-P, September 2000." This document is available at www.epa.gov.

2.0 Background

Two Records of Decision (RODs) have been signed for WAG 8. The first ROD was signed in 1994, and specified remedial actions for three inactive landfill sites at NRF that were part of Operable Units 8-05 and 8-06. The remedial actions included placement of a native soil cover over the landfill areas, periodic inspection and maintenance, soil gas and groundwater monitoring, and maintaining ICs. Institutional Controls are visible access restrictions and procedures to limit activities and unauthorized access at CERCLA sites. Their intent is to minimize potential exposure to contaminants that may remain at the sites, and to prevent interference with the integrity of selected remedies.

The second ROD was signed in 1998 for OU 8-08, which was identified as the Final Record of Decision, Naval Reactors Facility. This ROD identified specific remedial actions at nine radiologically contaminated sites, and also identified 12 'No Further Action' sites.

The remedial actions selected for the nine radiological sites (described in the Phase I and Phase II Remedial Design/Remedial Action (RD/RA) Work Plans) included excavating soil to below CERCLA cleanup levels to at least 10 feet below ground surface; consolidation of soil at the S1W Leaching Beds; placement of engineered covers at three locations; monitoring; and ICs. In 2001, in response to more than expected contamination found at NRF-21A, a decision was made to stop soil removal at this site, and to proceed with planning to cover the area with an engineered earthen cap. This decision was documented in an Explanation of Significant Difference to the ROD. In 2004, remedial actions for the nine radiological sites were completed. Final acceptance of the remedial actions by Naval Reactors Idaho Branch Office (NR/IBO), EPA and Idaho Department of Environmental Quality (IDEQ) will be through a Final Inspection and documentation of the work in the Remedial Action (RA) Report. The Final Inspection was performed in September 2005 by the EPA and in October by the IDEQ. The Draft RA Report was issued to the regulatory agencies in December 2005. The RA Report will certify that the remedies are operational and functional and have achieved, or are achieving, the ROD-specified performance standards. This report also describes what ICs will be required for the sites.

'No Further Action' sites are defined as follows: areas where contamination above risk based levels could be present; therefore, they are not yet releasable for unrestricted use, and thus require ongoing ICs. The 1998 ROD defined these sites as follows: "The 'No Further Action' decision means that the site will be included in the CERCLA review performed at least every five years to ensure that site conditions used to evaluate the site have not changed and to verify the effectiveness of the 'No Further Action' decision".

Bechtel Bettis Incorporated (BBI) has conducted a Five-Year Review of the remedial actions implemented for the twelve No Further Action sites and nine OU 8-08 Remedial Action sites at NRF. The review concluded that the selected remedies for the No Further Action sites appear to be effective in limiting unauthorized access and excavation. Furthermore, groundwater monitoring data indicate that activities at NRF have not adversely affected the groundwater. All of the data presented in the draft RA Report indicates that the selected remedies at the OU 8-08 sites have been successful in achieving Remedial Action Objectives; therefore, the remedy at OU 8-08 is expected to be protective of human health and the environment.

No additional remedial actions are required at this time. Current ICs, such as fencing and administrative controls on excavation, will be maintained. If site conditions or requirements change, including present ICs, the need for additional sampling and monitoring, or other actions, will be considered.

Institutional Controls may include the following:

1) Visible access restrictions
    a) Warning signs
    b) Fences, barriers, or permanent markers

2) Administrative controls for site activities:
    a) Bettis Atomic Power Laboratory NRF *10-Year Plan for Facilities and Infrastructure*
    b) OU 8-08 Areas Operation and Maintenance Plan
    c) OU 8-05/6 Landfill Operation and Maintenance Plan
    d) Public Notices
    e) Department of Energy Directives
    f) Site Radiological Controls Requirements
    g) Personnel Training
    h) Excavation Controls

3) Inspections

4) Unauthorized access safeguards

5) Published Surveyed Boundaries

6) Notice to affected stakeholders

7) Property lease and transfer regulatory requirements

The various CERCLA sites requiring ICs are briefly discussed below and are shown on Figure 1. The sites marked in red on Figure 1 are those where remedial actions were performed. The sites marked in blue are the ROD's original 'No Further Action' sites. The ICs at the OU 8-08 RA sites where excavation, removal actions, and engineered cover placement were recently completed have not been fully implemented; specifically, the placement of signs around the proposed boundaries at those sites where contamination remains at levels that preclude unrestricted release at this time. The signs will be placed at these sites after the OU 8-08 RA Report has been finalized and agency concurrence obtained on the proposed boundaries.

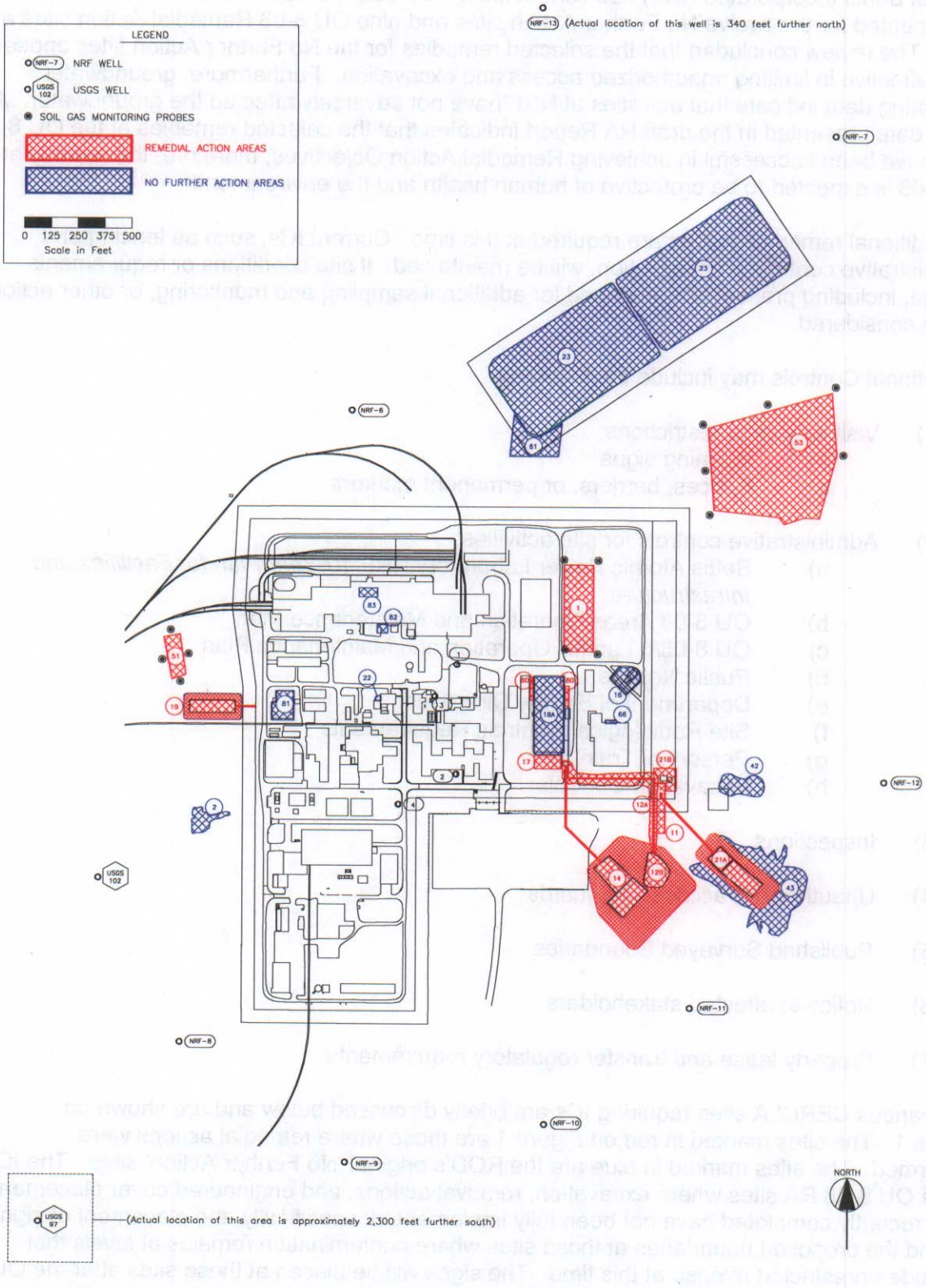

Figure 1 Location of NRF CERCLA Sites

The draft RA Report was issued in December 2005 and will become final early in 2006. This report will include a determination of the final status of the OU 8-08 sites. Therefore, inspections of the 8-08 Radiological Sites will be performed in 2006. The results of these inspections will be included in the 2006 ICMR.

2.1 Inactive Landfill Areas

NRF-1 Field area North of S1W – This site is similar to a municipal landfill containing construction debris and refuse such as petroleum products, small amounts of paint, solvents, and cafeteria wastes. NRF-1 was used between 1951 and 1960. A landfill cover was constructed over the site in 1996. In 2004, this site was enclosed in a six foot high chain link fence and reseeded with native vegetation species.

NRF-51 West Refuse Pit #4 – This site is similar to a municipal landfill containing construction debris and refuse such as petroleum products, small amounts of paint, solvents, and cafeteria wastes. This site was also used as a material staging area. NRF-51 was used between 1951 and 1963. A landfill cover was constructed over the site in 1996. In 2004, this site was enclosed in a six foot high chain link fence and reseeded with native vegetation species.

NRF-53 East Refuse Pits and Trenching Area – This site is a trenching and pit disposal area used for general refuse. The site was used between 1956 and 1970. Several types of refuse were disposed of here, including cafeteria wastes, leaves, grass, paper, small amounts of metal, oil, paints, and solvents. Refuse disposal occurred in trenches, and was regularly burned. A landfill cover was constructed over the site in 1996. In 2004, this site was enclosed in a six foot high chain link fence.

2.2 'No Further Action' Sites

NRF-02 Old Ditch Surge Pond - This site was a pond area that was connected to the industrial waste ditch system. Low levels of radioactivity and slightly elevated levels of metals were detected in the pond. The pond was used from approximately 1959 to 1985. The pond became contaminated with very low levels of radioactivity when water with trace amounts of cobalt-60 and cesium-137 was released to the ditch in the late 1960s. Accumulation of radioactivity in the ditch sediments produced slightly elevated levels that are below remediation goals.

NRF-16 Radiography Building Collection Tanks - The building was originally a decontamination building used for cleaning radioactive equipment. The decontamination solutions were sent to two underground tanks. These tanks were used from 1954 to 1960. Adjacent to the building was a concrete pad that was used for outdoor storage of radioactive material. The concrete pad was removed in 1979. The tanks were removed in 1993 with no indication of leakage. Elevated levels of radionuclides were detected in the surface soil from past spills in the area, but the levels were below remediation goals.

NRF-18A S1W Spray Pond #1 - The S1W Spray Pond #1 is a large concrete structure that contained cooling water for plant operations. At one time, a chromium based corrosion inhibitor was used in the water. Leakage and overspray from the pond caused elevated chromium concentration in the surrounding soil. A risk assessment showed a low risk for this site assuming the Spray Pond remains in place, thus limiting exposure to the soil below the basins in the event that any contamination is present. Between 2000 and 2002, the adjoining retention basin was removed (See Site NRF-17). Part of the spray pond was constructed over the

retention basin and was removed along with the basin. The floor of the spray pond was left intact, thus preserving the risk assessment assumption.

NRF-22 A1W Painting Locker French Drain - This site is the location of a former French drain that may have received paints, solvents, and possibly mercury. A removal action was performed in 1994 after receiving public comment on the proposed action. Sampling performed after the removal action showed elevated levels of lead and mercury remained. The excavated hole was 12 feet deep and was grouted to the surface eliminating all exposure pathways. The risk assessment of the site after the removal action estimated the risk to be low.

NRF-23 Sewage Lagoons - This site is the current sewage lagoons. The lagoons are two open rectangular ponds that measure 425 feet by 725 feet each. Analysis of the sediment has shown elevated levels of metals and radionuclides and only trace amounts of organics. The risk assessment assumed an institutional control period of 100 years. The risk assessment was very conservative. A risk management decision considered the nature and extent of the contaminants present, the protective nature of the present site conditions, and the assumption of 100 years of industrial controls; therefore, the actual risk associated with this site was considered acceptable.

NRF-42 Old Sewage Effluent Ponds - This site is the location of a former temporary sewage pond used in the 1950s. There is no evidence that a hazardous source exists at the site, but elevated amounts of metals, semi-volatile organics, and low-level radionuclide contaminants may be present based on sampling performed in the current sewage lagoons. The site is currently covered with a 10 foot layer of soil. Based on current conditions (i.e., 10 foot soil cover), the risk was estimated to be low.

NRF-43 Seepage Basin Pumpout Area - This site is an area that physically surrounds NRF-21A (Old Sewage Basin) and was formed when the contents of NRF-21A were pumped out in 1958. During the spring and summer of 2001, in conjunction with remediation of NRF-21A, the amount of contaminated soil and the size of NRF-21A were determined to be much larger than anticipated. A portion of NRF-21A extended into the previously identified NRF-43 area. NRF and the regulatory agencies decided that NRF-21A including the extended portion into NRF-43 would be capped with an earthen cover similar in design to those slated for NRF-12/14 and NRF-19. Remedial actions at this site are now complete. Final acceptance of the remedial actions is pending the review and finalization of the OU 8-08 Remedial Action (RA) Report (that also includes the Institutional Control Plan) which is expected to be issued as a final document early in 2006.

NRF-61 Old Radioactive Materials Storage and Laydown Area - This site is the former location of a radioactive material storage and laydown area that was used from 1954 to 1960. Soil sampling showed detectable amounts of cesium-137 that were well below remediation goals. The risk was determined to be low.

NRF-66 Hot Storage Pit - This site is an area where a tanker truck collected radioactive liquid waste for transportation to other INL facilities for processing. Spills reportedly occurred in this area. Contaminated soil was removed from the area in 1980. Sampling during the remedial investigation showed slightly elevated amounts of cesium-137 that were well below remediation goals.

NRF-81 A1W Processing Building Area Soil - This site is an area around a radioactive materials processing building where known spills have occurred in the past. Typically, these

spills were cleaned up to the maximum extent possible at the time. Cesium-137 and cobalt-60 were the only radionuclides detected during past sampling, and were below remediation goals.

NRF-82 Evaporator Bottoms Tank Release - This site consists of the soil above an underground storage tank vault. One spill was known to have occurred at the area in 1972. The spill was cleaned up to the standards at the time, but slightly elevated amounts of radioactivity were reported after the cleanup. Additional cleanup was performed in 1977. The remaining radioactivity is below remediation goals.

NRF-83 ECF Hot Cells Release Area – NRF-83 is located within an operational building (Expended Core Facility) and is adjacent to hot cells that are currently in use. This site is the location of a radioactive liquid release that occurred in 1972. Radioactive liquid was released from a pipe to a concrete trench. The soil below and adjacent to the trench also became contaminated. Cleanup actions taken in 1972 did not include the soil below the trench. The contaminated soil was discovered in 1997 when a concrete pad adjacent to the concrete trench was removed during ECF upgrade work. Elevated amounts of cobalt-60 and cesium-137 are present in the soil. All accessible contaminated soil was removed and replaced with clean soil during the construction project. An estimated 28 cubic meters of contaminated soil remain under the trench to preserve the integrity of the trench. A new concrete pad was poured at the location of the old concrete pad excavation; therefore, the contaminated soil below the trench is not presently accessible, so no exposure route exists at this time.

2.3 Remedial Action Sites (OU 8-08)

NRF-11 S1W Tile Drainfield and L-shaped Sump - This site consisted of a below-surface concrete L-shaped sump and four underground perforated drainfield pipes of various lengths downstream of the sump. The drainfield was likely used between 1953 and 1955 for sewage and radioactive liquid discharges. The drainfield area was approximately 36 feet wide by 150 feet long and consisted of four perforated pipes buried parallel to each other approximately eleven feet deep. Each outside leg of the drainfield extended about 150 feet, while both inner legs were 50 feet long. The drainfield was connected to the sump, which was an L-shaped concrete structure. Each leg of the sump was 11 feet long and three feet wide with a maximum depth of 12-1/2 feet. The sump was isolated from the drainfield in 1955, but was used until 1960 as part of the sewage system. The primary remedial action associated with this site was excavation of piping, concrete, and soil above remediation goals. During the summer of 2002, piping and concrete associated with this site was removed. Soil above remediation goals was removed, leaving only trace amounts of contamination. All remedial action work associated with this site is now complete.

NRF-12A Underground Piping Leading to Leaching Pit - This site consisted of an underground pipe (465 feet in length) that ran from the S1W Retention Basins (NRF-17) to a subsurface concrete manhole. This pipe is known to have leaked on occasion. From the manhole, a perforated pipe used for draining and leaching purposes ran approximately 400 feet to the S1W Leaching Pit (NRF-12B). This site was used from 1955 through 1961 for radioactive liquid discharges. The primary remedial action associated with this site was removal of the manhole, excavation of piping and removal of soil above remediation goals. The piping leading from the leaching pit to the concrete culvert near the L-Shaped Sump has been removed, as has the contaminated soil above the cleanup standards within at least ten feet of the ground surface. The line and associated contaminated soil from the concrete culvert to the old retention basin were also removed. Residual contamination above CERCLA remediation goals, which were applicable to the upper 10 feet of soil only, exists below the ten foot depth along

some locations where the pipe has been removed; therefore, this site will likely require long-term institutional controls (such as drilling restrictions) to prevent future exposure to the contaminated soils. The completed RA report will define the final institutional controls. All remedial action work associated with this site is now complete.

NRF-12B S1W Leaching Pit - This site consists of a former pit area that was used for radioactive discharges. The pit was constructed at the end of the drainfield piping (NRF-12A) in 1957 and was used until 1961. The pit was filled in with soil, and in 1978 an asphalt cap was placed over the pit. In preparation for construction of an earthen cover, the asphalt cap was demolished and removed during the summer of 2003. In 2004, an earthen cover was constructed over NRF-12B and the adjoining NRF-14 site. The site was seeded with native vegetation species during the summer of 2004. The combined site was enclosed by a six foot tall chain link fence in the fall. All remedial actions with this site are now complete, including the final inspection of the engineered cover over this site by NR/IBO, IDEQ, and the EPA. Final acceptance of the remedial actions is pending the review and finalization of the OU 8-08 Remedial Action (RA) Report (that also includes the Institutional Control Plan) which is expected to be issued as a final document early in 2006.

NRF-14 S1W Leaching Beds - This site consists of two leaching beds, one constructed in 1960 and the other in 1963. These beds were open ponds that collected radioactive water and allowed the water to leach into the subsurface or evaporate. Each bed was about 75 feet by 125 feet at the water line and was 13 to 15 feet deep. The ponds were used until 1979. Large cobblestones were placed in the leaching beds in 1972. Earthen ramps were constructed to allow sampling equipment into the beds in 1992. This site includes the underground pipe leading to the leaching beds from the S1W Retention Basins (NRF-17). The primary remedial actions associated with this site were the excavation of the pipe leading to the beds, consolidation of soil from other CERCLA sites into the beds, and construction of an engineered cover over the area. The pipe leading to the beds has been excavated and removed. Contaminated soil above remediation goals was encountered within 10 feet of the surface along a small portion of pipe and was removed. Residual contamination exists below the 10 foot depth along a small portion of the pipe location. Soft sided containers filled with soil removed from other remediation sites were placed in the beds and covered with clean fill dirt. In 2004, an earthen cover was constructed over NRF-14 and the adjoining NRF-12B site. The site was seeded with native vegetation species during the summer of 2004. The combined site was enclosed by a six foot tall chain link fence in the fall. All remedial actions with this site are now complete, including the final inspection of the engineered cover over this site by NR/IBO, IDEQ, and the EPA. Final acceptance of the remedial actions is pending the review and finalization of the OU 8-08 Remedial Action (RA) Report (that also includes the Institutional Control Plan) which is expected to be issued as a final document early in 2006.

NRF-17 S1W Retention Basins - This site consisted of two concrete basins partially below grade that collected radioactive water from various facilities. This was a storage area prior to releasing the water to NRF-11, NRF-12A/12B, and NRF-14. The basins were constructed in 1951. The basins comprised two adjacent concrete structures, each 140 feet long by 34 feet wide. One of the basins was known to have leaked approximately 33,000 gallons in 1971. The leak was directly below the basins. The remedial actions associated with this site were the removal of the concrete structures and excavation of contaminated soil above remediation goals. Demolition of the concrete structures and removal of contaminated soil beneath occurred between 2000 and 2002. Detectable levels of residual radioactivity remain in the soil but at levels that are below remediation goals. All remedial action work associated with this site is now complete.

NRF-19 A1W Leaching Bed - This site consisted of an underground leaching bed. Perforated pipes ran through an engineered leaching bed that consisted of various layers of gravel and sand. The bed was constructed west of NRF in 1957, and was used continually from 1958 to 1964 and sporadically between 1964 and 1972. The bed was 200 feet long and 50 feet wide. Two underground pipes led to the leaching bed. The remedial actions associated with this site were the excavation of the pipes leading to the bed and any associated contaminated soil and the construction of an engineered cover over the area. The piping leading to the beds and the contaminated soil above remediation goals have been excavated and removed. The area was covered with clean fill dirt in 2003. In 2004, an earthen cover was constructed over NRF-19. The site was seeded with native vegetation species during the summer of 2004. The site was also enclosed by a six foot tall chain link fence in the fall. All remedial actions with this site are now complete, including the final inspection of the engineered cover over this site by NR/IBO, IDEQ, and the EPA. Final acceptance of the remedial actions is pending the review and finalization of the OU 8-08 Remedial Action (RA) Report (that also includes the Institutional Control Plan) which is expected to be issued as a final document early in 2006.

NRF-21A Old Sewage Basin - This site consists of a former open pond used for non-radiological discharges that was cross-contaminated from a radiological system. An unknown amount of radioactive effluent was sent to the sewage basin. The sewage basin was constructed in 1956 and measured 72 feet by 72 feet by 11 feet deep. A 10-inch concrete pipe led to the sewage basin from the L-shaped sump (part of NRF-11). The basin was enlarged in 1957 in the southeast direction to approximately double the original length and was used until 1960. The basin has since been filled in with soil. The remedial actions associated with this site were the excavation of piping and contaminated soil above remediation goals. After a portion of the piping and contaminated soil had been excavated, it was determined that contaminated soil above remediation goals extended significantly into the expanded portion of the basin. In July 2002, an Explanation of Significant Difference was signed by NR/IBO, IDEQ, and the EPA, and issued to the public to modify the preferred remedy to include construction of an engineered natural earthen cover over the original and expanded area. The concrete pipe and contamination adjacent to the pipe has been removed. The existing mound over the basin was removed, and in 2004 an earthen cover was constructed over NRF-21A. The site was seeded with native vegetation species during the summer of 2004. The site was also enclosed by a six foot tall chain link fence in the fall. All remedial actions with this site are now complete, including the final inspection of the engineered cover over this site by NR/IBO, IDEQ, and the EPA. Final acceptance of the remedial actions is pending the review and finalization of the OU 8-08 Remedial Action (RA) Report (that also includes the Institutional Control Plan) which is expected to be issued as a final document early in 2006.

NRF-21B Sludge Drying Bed - This site consisted of a concrete bed that received sludge from the sewage system. It was cross-contaminated from a radiological system. The bed was constructed in 1951 as part of the sewage system at NRF. The bed was a concrete slab that was 28 feet by 29 feet and was approximately five feet below grade. The primary remedial actions associated with this site were the excavation of concrete and soil above remediation goals. Contaminated sediment above the concrete bed was removed along with the concrete. Analytical results from soil samples collected after the excavation was completed verified that no contamination remained at the site above remediation goals. All remedial action work associated with this site is now complete.

NRF-80 A1W/S1W Radioactive Line Near BB19 - This area consisted of an underground pipe that was known to have leaked near the S1W Spray Pond. The pipe carried radioactive water

for eventual discharge to the S1W Leaching Beds (NRF-14). The pipe was buried approximately six feet below the surface. During decontamination and dispositioning work at NRF in 1995, portions of the pipe were removed and contamination was detected in the soil. The primary remedial actions associated with this site were the excavation of piping and contaminated soil above remediation goals. Remedial actions have been completed at this site; contaminated soil above remediation goals was not encountered. The remaining soil has elevated radioactivity, primarily cobalt-60, below remediation goals. All remedial action work associated with this site is now complete.

3.0 Facility-wide Institutional Controls

3.1 Soil Disturbance

A significant control required for the NRF CERCLA areas discussed above is preventing unauthorized disturbance of soil. NRF addresses unauthorized or accidental excavation in these areas using a combination of training and engineering controls to ensure that no excavation occurs without first obtaining the concurrence of NRF environmental personnel. These controls are included in several NRF guidance and policy manuals. Together, these actions constitute NRF's site-wide ICs for controlling excavation activities. Each aspect of the ICs is discussed below.

3.1.1 Cognizant Engineer/ESH Engineer

The NRF Cognizant Engineer or Scientist (CE/S) is the person who is primarily responsible for ensuring that rules for performing various work functions are followed and that work is performed according to written procedure. All work at NRF is documented in one of three ways. These are Preventive Maintenance (PM) cards, Technical Specifications, or Technical Work Documents (e. g., normal radiological work documents; Radiological Work Permits for work in areas previously released for controlled use but where contamination may still exist on inaccessible surfaces; and NRF forms containing site-specific information for non-radiological work). These documents and associated work must be reviewed and approved by NRF Environmental Engineering and Safety personnel if they pertain to environmental and safety issues. For example, if this work involves excavation, the NRF CE/S must ensure an excavation permit is prepared, as discussed below.

3.1.2 Excavation Permits

Integral to the process of preventing unauthorized excavation of CERCLA sites is the 'Excavation Permit'. This permit is initiated by the CE/S, and is required for all excavation activities at NRF. The Excavation Permit identifies each NRF organization that must be notified prior to the commencement of excavation, including Radiological Controls, Environmental Engineering (for CERCLA), and Safety. Cognizant personnel are trained in the initialization procedures and use of the Excavation Permit.

3.1.3 Personnel Training

Training is the primary tool used at NRF to ensure that all personnel know their responsibilities. NRF has several training programs that contribute to the concept of ICs. The Environmental Training Program helps ensure that personnel involved in activities with environmental concerns will follow procedures and communicate with others as needed.

Each employee at NRF receives general Environmental, Safety, and Health (ESH) training in the form of annual training and periodic bulletins covering a broad range of ESH issues. All NRF employees and subcontractors are routinely trained to be sensitive to identification of CERCLA sites, and instructed not to enter any CERCLA site without first contacting Environmental Engineering.

3.2 Unauthorized Access

At NRF, all CERCLA sites are either within the main NRF fenced area or within a short distance of the outer perimeter fence (i.e., within areas monitored by NRF Security). In addition, INL security personnel are responsible for controlling access onto INL and for patrolling all areas at INL outside secured compounds, including around NRF. INL security is effective in stopping accidental incursion onto INL and prohibiting deliberate incursion. Thus, CERCLA areas outside the NRF perimeter fence are protected.

Although INL personnel are responsible for security outside the NRF perimeter fence, areas that are near NRF are watched by NRF security personnel as well. Any unusual or unexpected activity outside the perimeter fence is immediately reported to and investigated by INL and/or NRF security personnel. Any activity being performed by NRF personnel (or other authorized personnel) outside the perimeter fence must be reported to NRF security prior to its initiation.

As part of local security measures, all NRF personnel receive badges that must be worn in a conspicuous location on their persons at all times. This significantly reduces the chance that unauthorized personnel could intrude onto the NRF site in general, and specifically the CERCLA sites, without being detected. Similar badging procedures are practiced at other INL sites. All personnel that visit INL must receive temporary badges upon presentation of proper identification and upon approval from cognizant INL personnel. Uncleared visitors without building access only (BAO) authorization are escorted to and from NRF. All non-routine access roads leading to NRF are blocked by road closed signs instructing personnel to contact security before proceeding.

3.3 Radiological Controls

NRF has a Radiological Controls Program that includes administrative controls, access restrictions, and training. All areas with the potential for radiological contamination, including CERCLA sites, require strict controls on access and work to minimize contact by personnel and minimize the potential spread of contamination. All work in potentially radiologically contaminated areas requires written work instructions. All radiological work documents are carefully reviewed by personnel trained in Radiological Controls and their approval is required before work can commence. Once work commences, Radiological Controls provides overview of the project.

All employees and visitors to the NRF site receive, as a minimum, training that identifies potential radiological hazards, recognition of warning barriers and signs, and response requirements to radiological situations. All NRF employees receive annual radiological refresher training. A large number of NRF employees and subcontractors also receive additional training to be qualified to work in or near specific radiological sites.

All areas with the potential for radioactivity are routinely monitored for fixed and loose contamination. All NRF radiological workers are monitored for internal exposure to radioactivity.

Those who routinely work in potential radiologically contaminated areas receive more frequent radiological monitoring.

3.4 Land Transfer and Use Restrictions

The presumption in the ROD is that the land area within WAG 8 will not be subject to leasing or property transfer through at least the year 2095 (100 years from initial risk assessments performed at NRF). The Bettis Atomic Power Laboratory NRF 10-Year Plan for Facilities and Infrastructure (formally known as the Bettis Atomic Power Laboratory Site Development Plan) will document and describe land areas under restrictions and controls. Although, as stated, no land use changes are expected, the plan will describe any procedures required for the leasing and transfer of NRF property, and will reinforce that actions will not be taken without the mutual concurrence of NR/IBO, IDEQ, and EPA.

4.0 Site-specific Institutional Controls

In addition to facility-wide ICs in place at NRF, site-specific ICs are present at most sites. Table 1 provides a description of the controls currently in place at each of the specific sites.

Site specific controls include fencing, signs, and inspections. Inspections are discussed in Section 5. Fencing and signs are visible access restrictions and are discussed in detail in Section 4.1 of the NRF Institutional Control Plan. In brief, warning signs required for ICs are conspicuously placed intermittently along the boundary of a controlled area. NRF CERCLA warning signs possess an orange background with black lettering, the font of which is proportional to the size of the sign. Signs are at least 8.5 x 11 inches. Warning signs indicate site name, general hazard (i.e., 'Radionuclides', 'Metals', etc.), access restrictions (i.e., 'No Unauthorized Excavation'), and point of contact (e.g., 'Environmental Engineering').

During the late summer of 2004, new fences were constructed around all sites with earthen covers including NRF-1, NRF-51, NRF-53, NRF-12B, NRF-14, NRF-19 and NRF-21A. The fences are constructed with chain link, six feet high, and have access gates. The gates are locked and the fences posted with signs to prevent unauthorized human intrusion onto the earthen covers. Although not capable of preventing all animal intrusion, these fences will inhibit large animals (deer, antelope and elk) from encroaching onto the covers.

Table 1 Site Specific Institutional Controls

CERCLA Site		Site-Specific Institutional Controls
Landfill Sites		
NRF-1	Field Area North of S1W	• Fencing • Excavation Controls • Signs • Inspections
NRF-51	West Refuse Pit #4	• Fencing • Excavation Controls • Signs • Inspections
NRF-53	East Refuse Pit and Trenching Area	• Fencing • Excavation Controls • Signs • Inspections
No Further Action Sites		
NRF-2	Old Ditch Surge Pond	• Excavation Controls • Signs • Inspections
NRF-16	Radiography Building Collection Tank Area	• Existing fence also within NRF Fenced Area • Excavation Controls • Signs • Inspections
NRF-18A	S1W Spray Pond #1 and Portions of the Fire Protection System	• Within NRF Fenced Area • Excavation Controls** • Signs • Inspections
NRF-22	A1W Painting Locker French Drain	• Within NRF Fenced Area • Excavation Controls** • Signs • Inspections
NRF-23	Sewage Lagoons	• Existing Fencing • Excavation Controls • Signs • Inspections
NRF-42	Old Sewage Effluent Ponds	• Excavation Controls • Signs • Inspections
NRF-43	Seepage Basin Pumpout Area	• Excavation Controls • Signs • Inspections
NRF-61	Old Radioactive Materials Storage and Laydown Area	• Excavation Controls • Signs • Inspections
NRF-66	Hot Storage Pit	• Within NRF Fenced Area • Excavation Controls • Signs • Inspections
NRF-81	A1W Processing Building Area Soil	• Within NRF Fenced Area • Excavation Controls • Signs • Inspections

**Currently beneath a structure

Table 1 Site Specific Institutional Controls (Continued)

CERCLA Site		Site-Specific Institutional Controls
NRF-82	Evaporator Bottoms Tank Release	• Within NRF Fenced Area • Excavation Controls • Signs • Inspections
NRF-83	ECF Hot Cells Release Area	• Within NRF Fenced Area • Excavation Controls** • Inspections
Remedial Action Sites (OU 8-08)		
NRF-11	S1W Tile Drainfield and L Shaped Sump	• Majority within NRF Fenced Area • Excavation Controls • Signs* • Inspections
NRF-12A	Underground Piping to Leaching Pit	• Portion within NRF Fenced Area • Excavation Controls • Signs* • Inspections
NRF-12B	S1W Leaching Pit	• Fencing • Excavation Controls • Engineered Earthen Cover • Signs • Inspections
NRF-14	S1W Leaching Beds	• Fencing • Excavation Controls • Engineered Earthen Cover • Signs • Inspections
NRF-17	S1W Retention Basin	• Within NRF Fenced Area • Excavation Controls • Signs* • Inspections
NRF-19	A1W Leaching Bed	• Fencing • Excavation Controls • Engineered Earthen Cover • Signs • Inspections
NRF-21A	Old Sewage Basin	• Fencing • Excavation Controls • Engineered Earthen Cover • Signs • Inspections
NRF-21B	Sludge Drying Bed	• Within NRF Fenced Area • Excavation Controls • Signs* • Inspections
NRF-80	A1W/S1W Radioactive Line Near Butler Building 19	• Within NRF Fenced Area • Excavation Controls • Signs • Inspections

* Signs will be placed at these sites after the RA report is finalized, which identifies the site boundary.

**Currently beneath a structure.

5.0 Facility Wide Inspections

5.1 Inspection Methodology

The NRF inspection plan is currently applicable to the inactive landfill cover areas, the site benchmarks located within each cover area, soil gas wells, groundwater monitoring wells, and 'No Further Action' sites. Each of these is inspected at least annually. Inspections for OU 8-08 sites where remedial actions are complete and where a final inspection by NR/IBO, IDEQ, and EPA was completed, will be conducted for the first time in 2006. The annual inspection of the OU 8-08 sites that are under an engineered cover will include the same elements as the engineered cover area inspection for the inactive landfill areas. Since soil moisture monitoring access tubes are located within the OU 8-08 sites that are under an engineered cover, an inspection of these tubes will also be performed. The OU 8-08 sites where contamination remains at levels that preclude unrestricted release at this time will be managed using ICs identical to those applicable to the 'No Further Action' sites, and annual inspections will include the same elements as for the 'No Further Action' sites. The following sections discuss the inspection details.

5.1.1 Engineered Cover Area Inspection

The annual inspections of the engineered covers over the inactive landfill areas and over four of the OU 8-08 radiological sites are recorded on an inspection form. Elements of the site inspection are as follows:

1. Observe any areas on the cover that indicate signs of subsidence (e.g., obvious visible low spots on the cover surface where significant amounts of standing water could accumulate during major precipitation events).

2. Check for the presence of large cracks on the surface of the cover or signs of animal intrusion.

3. Observe any signs of erosion on the landfill cover (e.g., during windy conditions observe any evidence of dust blowing off of the cover, and check for erosion caused by storm-water runoff).

4. Check the condition of the vegetative cover (e.g., check for bare spots in the vegetative cover; note whether no vegetation has grown or whether the vegetation has died and has not been re-established; check for abnormal growth of weeds that may crowd out desired vegetation).

5. Check for any damage to the signs, fencing, fence posts, and access gates located near or around the sites.

A surveillance of the covers is to be conducted after a significant precipitation event (e.g., severe thunderstorms, prolonged rain events, or rapid snow melting) in which the soil's infiltration capacity is exceeded. This is done to determine whether significant erosion or run-on/runoff has occurred. Indications of water run-on (from adjacent areas) to and runoff from the cover areas will be recorded during the surveillance and rectified by diverting the run-on source and making repairs to the areas where excessive erosion has taken place on the cover. The areas where excessive erosion has occurred will be evaluated and a determination will be made as to the cause of the erosion. During 2005, significant precipitation events occurred; however, subsequent surveillances did not reveal any problems.

5.1.2 Site Benchmark Inspection

The benchmarks around the designated inactive landfill cover areas and OU 8-08 cover areas, including soil gas and groundwater monitoring wells, are inspected annually, and results of the inspections are recorded on an inspection form. Elements of the site inspections are as follows:

1. Check the condition of the brass benchmark implanted on the concrete pad. Ensure the concrete has not deteriorated around the benchmark and that the etched mark is still legible. Check for cracks on the concrete pad (monitor any minor cracks to ensure they do not widen and compromise the pad's integrity).

2. Check the general condition of the bollards that encircle the benchmark concrete pad; make sure the bollards are intact (have not been knocked over by a vehicle), are painted properly, and the paint is in good condition.

5.1.3 Soil Gas Monitoring Well Inspection

A routine visual and functional inspection of the soil gas monitoring wells is conducted during the scheduled sampling of these locations (4 times per year). Any obvious problem is immediately reported to Environmental Engineering personnel. An annual inspection is conducted with the results of the inspection recorded on an inspection form. Elements of the site inspection are as follows:

1. Check the well casing for signs of damage. Verify that it is intact, corrosion free, and undamaged.

2. Check to ensure that locks are in working condition. Look for signs of corrosion and forced entry.

3. Ensure that the well is functioning correctly (problems reported as needed after quarterly sampling).

4. Verify that the concrete pad and bollards are undamaged. Also verify that the paint on the bollards is in good condition.

5.1.4 Groundwater Monitoring Well Inspection

A routine visual and functional inspection of the groundwater monitoring wells is conducted during the scheduled sampling of these locations (3 times per year). Any obvious problem is immediately reported to Environmental Engineering personnel. An inspection is conducted annually with the results of the inspection recorded on an inspection form. Elements of the inspection are as follows:

1. Check to ensure that locks are in working condition. Look for signs of corrosion and forced entry.

2. Check the housing around the well head. Verify that it is intact, corrosion free, and undamaged. Ensure that the lock hasp is intact and free from damage and corrosion. Look for signs of forced entry.

3. Check electrical wiring and plug for signs of damage.

4. Check the measuring line pipe and discharge pipe for signs of corrosion. Ensure that caps are present on these two pipes.

5. Verify that the concrete pad and bollards are undamaged. Also verify that the paint on the bollards is in good condition.

6. Ensure that each well is functioning correctly (problems reported as needed after trimester sampling).

5.1.5 Soil Moisture Monitoring Access Tube Inspection

A routine visual inspection of the soil moisture monitoring access tubes (currently used for obtaining soil moisture data using a neutron probe) located within the OU 8-08 engineered cover areas is conducted during the scheduled acquisition of soil moisture data at these locations. In addition, an annual inspection is conducted with the results of the inspection recorded on an inspection form. Elements of the site inspection are as follows:

1. Check the individual access tubes for signs of damage; verify that they are intact, corrosion free, and undamaged.

2. Check to ensure that the padlocks are in working condition (not stiff when unlocking the padlock, and free of damage or corrosion). Look for signs of corrosion and forced entry.

3. Verify that the bollards around the access tubes are undamaged. Also verify that the paint on the bollards is in good condition.

Repairs shall be made as soon as practical after the discovery and assessment of damage.

5.1.6 'No Further Action' Sites

An inspection of the 'No Further Action Sites' is conducted annually to ensure that site conditions have not changed (i.e., that the site meets the 'No Further Action' criteria as described in the 1998 ROD). OU 8-08 sites where contamination remains at levels that preclude unrestricted release at this time are to be managed using ICs identical to those applicable to 'No Further Action' sites. The inspection elements for these OU 8-08 sites will be the same as for the 'No Further Action' sites. Results of the inspection are recorded on an inspection form.

1. Where applicable, look for evidence of human or animal intrusion.

2. Where present, ensure that signs that describe the nature of the site are clearly visible and undamaged.

3. Where present, ensure that fences are intact and in good condition.

4. Where present, inspect boundary markers.

5. Where appropriate, look for signs of unauthorized excavation.

5.2 Inspection Results

The following sections summarize 2005 inspection results as contained in the inspection checklists contained in Attachments 2-A through 5-A. Section 6.0 discusses inspection deficiencies in greater detail.

5.2.1 Engineered Landfill Cover Area Inspection

On July 14 and August 29, 2005, inspections of the engineered landfill covers were performed. Table 2 summarizes the results of the inspections (Attachment 2-A). Representative photographs are included in Attachment 2-B. All three sites showed signs of minimal ant hill and weed encroachment. Weed encroachment at all three sites was less than the previous year. This year NRF-53 and NRF-1 also showed notable signs of burrowing from small animals (rodents). The ant hills are generally small and do not negatively affect the performance of the covers. The burrows are small and the presence of the small animals seemed to impact some of the vegetation since it was used as a food source; however, the effects did not significantly impact the performance of the covers. The covers at NRF-1 and NRF-51 were reseeded in December 2004. The result from the reseeding was observed during late spring 2005 and some seedlings were noted, particularly in the non-growth area in the southwest corner of NRF-1 and sparse vegetation areas of NRF-51. The sparse area at NRF-53 noted in the 2004 inspection showed notable signs of improvement in that the desirable vegetation was starting to grow in this area. Particular attention will be paid to these areas at all three sites during future inspections to determine if continued growth is occurring. Additional actions, if any, will be determined during future scheduled inspections.

5.2.2 Site Benchmarks

All benchmarks at the soil gas and groundwater monitoring wells were found to be in good condition. No problems were noted.

Table 2 Summary of Engineered Soil Cover Inspections

Location	Subsidence or Slope Movement	Cracks or Animal Intrusion	Erosion	Non Growth Areas	Sparse Growth Areas	Weeds Encroaching.
NRF-1	None	Rodent holes and ant hill	None	SW corner	Minimal	SW corner and north end but less than previous year
NRF-51	None	Several ant hills	None	Minimal	Minimal	Some weed encroachment on east side but less than previous year
NRF-53	None	Rodent holes and several ant hills	None	Minimal	Minimal	Weed encroachment on SW corner and NW corner but less than previous year

Minimal = although present, it is not readily noticeable

5.2.3 Soil Gas Monitoring Wells

On July 14 and August 29, 2005, inspections of the soil gas wells were performed (Attachment 3-A). Table 3 summarizes the results of the inspections.

Table 3 Summary of Soil Gas Monitoring Wells Inspections

	Location	Casing and Locks	Monitoring Tube	Concrete Pads and Bollards	Function
OU 8-05-1	MW1-1	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW1-2	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW1-3	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW1-4	Satisfactory	Satisfactory	Satisfactory	No problems noted
OU 8-05-51	MW51-1	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW51-2	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW51-3	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW51-4	Satisfactory	Satisfactory	Satisfactory	No problems noted
OU 8-06-53	MW53-1	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW53-2	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW53-3	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW53-4	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW53-5	Satisfactory	Satisfactory	Satisfactory	No problems noted
	MW53-6	Satisfactory	Satisfactory	Satisfactory	No problems noted

5.2.4 Groundwater Monitoring Wells

On July 14 and November 17, 2005, inspections of the applicable groundwater monitoring wells were performed. Table 4 summarizes the results of the inspections (Attachment 4-A). Representative photographs are included in Attachment 4-B.

Table 4 Summary of Groundwater Monitoring Well Inspection Results

Well Name	Locks and Housing	Wiring	Measuring and Discharge Lines	Concrete Pads and Bollards
NRF-6	Satisfactory	Satisfactory	Satisfactory	Satisfactory
NRF-7	Satisfactory	Satisfactory	Satisfactory	Satisfactory
NRF-8	Satisfactory	Satisfactory	Satisfactory	Satisfactory
NRF-9	Satisfactory	Satisfactory	Satisfactory	Satisfactory
NRF-10	Satisfactory	Satisfactory	Satisfactory	Satisfactory*
NRF-11	Satisfactory	Satisfactory	Satisfactory	Satisfactory
NRF-12	Satisfactory	Satisfactory	Satisfactory	Cracked paint
NRF-13	Satisfactory	Satisfactory	Satisfactory	Satisfactory

*- Pad crack noted in 2004 inspection repaired

5.2.5 'No Further Action' Sites

On July 14, August 29, and November 1 and 2, 2005, inspections of the 'No Further Action, sites were performed. Ant hills and signs of burrowing (e.g., rodent holes and potential badger hole) were noted at Sites NRF-2, NRF-42, NRF-43, and NRF-61 in the 2005 inspection.

However, the presence of these intrusions are not significant and do not impact the protectiveness of the sites. Table 5 summarizes the results of the inspections (Attachment 5-A). Representative photographs are included in Attachment 5-B.

Table 5 Summary of 'No Further Action' Sites Inspection Results

Location	Human/Animal Intrusion/Excavation	Signs	Fences	Boundary Markers
NRF-2	Ant hills/Potential Badger Hole	Satisfactory	NA	NA
NRF-16	Satisfactory	Satisfactory	Satisfactory	NA
NRF-18A	Satisfactory	Satisfactory	NA	NA
NRF-22	Beneath Building	Satisfactory*	NA	NA
NRF-23	Satisfactory	Satisfactory	Satisfactory	NA
NRF-42	Ant hills	Satisfactory	NA	NA
NRF-43	Ant hills and Rodent Hole	Satisfactory	NA	NA
NRF-61	Ant hills and Rodent Holes	Satisfactory	NA	NA
NRF-66	Satisfactory	Satisfactory	Satisfactory	NA
NRF-80	Satisfactory	Satisfactory	NA	NA
NRF-81	Satisfactory	Satisfactory	Satisfactory	NA
NRF-82	Satisfactory	Satisfactory	NA	NA
NRF-83	Beneath Building	Beneath Building	NA	NA

*Sign is posted on east wall of the site and a painted sign is on concrete pad over the site

5.2.6 Remedial Action Sites

A final inspection of the engineered cover areas was performed by NR/IBO, IDEQ, and the EPA in 2005. The purpose of the final inspection was to ensure that the deficiencies (including IC issues) from the pre-final inspection were resolved. Documentation of the final inspection results from the IDEQ and EPA stated that the deficiencies had been adequately resolved. That documentation is included in the draft RA Report. Annual inspections appropriate for each site will be performed and the results reported in future ICMRs.

The Operation and Maintenance Plan, included in the draft OU 8-08 RA Report, states that soil moisture data is to be presented in the annual ICMR. This approach was concurred with by IDEQ and the EPA. Although the OU 8-08 RA Report has not been finalized, this is the first year that soil moisture data was collected and the data is presented in this report (Attachments 1-A and 1-B).

6.0 Deficiencies

No major deficiencies were noted in the way ICs are implemented at NRF, nor did the site inspections reveal any major problems. Several issues noted as minimal were raised by the inspections. These are discussed below. Table 6 documents the deficiencies noted in the 2004 inspection and corrected in 2005.

The vegetation at the NRF-1 engineered cover continues to be sparse at the SW corner and along the north perimeter, and NRF-51 also has a sparse area. This situation has been

observed for several years, and the natural re-vegetation process has increased the vegetation density. Reseeding in December 2004 resulted in the growth of some new seedlings in these areas, particularly the NRF-1 SW corner and the NRF-51 sparse area. These areas will continue to be closely monitored during future inspections.

No significant deficiencies were noted with the groundwater monitoring wells. The 2004 ICMR noted that the pad surrounding the well stem at NRF-10 contained cracks that encircled the well pipe. The cracks were sealed in late summer 2005, to maintain the line of defense preventing surface water from reaching the subsurface.

During the 2004 inspection, the barbwire that surrounds NRF-23 was observed to be sagging or down in several locations. A similar deficiency was noted and fixed in 2003. The fence was repaired in 2005. No damage was observed during the 2005 inspection; however, the barbwire fence at NRF-23 will continue to be closely monitored during future inspections.

Overall, the conditions at the 'No Further Action' sites have remained stable; therefore, no threat to human health or the environment is apparent. No additional corrective actions are necessary based on the 2005 inspections.

As specified in the NRF ROD for OU 8-08, current ICs adequately protect the CERCLA areas from accidental or purposeful intrusion, and adequately protect the health and safety of NRF personnel and the public.

Table 6 Summary of Corrective Actions

Location	Deficiency	Corrective Action	Corrective Time-Frame
NRF-23	Fence Sagging/Down (from 2004)	Fix fence	Complete*
NRF-10	Concrete pad cracked (from 2004)	Seal cracks	Complete*

* Corrected in 2005.

Section 7.0 Point of Contact

All questions or comments concerning NRF ICs should be directed to Wendy R. Dixon of IBO/NR at (208) 533-5294.

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Attachment 1-A

OU 8-08 Engineered Cover Areas

Soil Moisture Data

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Preface to Attachment 1-A

This attachment consists of soil moisture data for the OU 8-08 engineered covers. Soil moisture content within the engineered cover at each site is estimated by obtaining measurements from a neutron probe via access tubes that were installed on the three engineered cover areas during their construction in 2004. The soil moisture data is used to assess the effectiveness of the covers in mitigating water infiltration to the contaminant zone. This is accomplished by evaluating the covers' water storage capacity; specifically, by monitoring the depth of the wetting front attributed to percolating water from precipitation. The soil moisture measurement data raw counts, obtained from the neutron probe instrumentation, have been converted to volumetric water content in percent.

Soil moisture measurements were initiated in 2005, since the vegetation on the covers was not fully established in 2004 and since the added moisture retained in the covers during the construction process would have skewed the results. For 2005, soil moisture measurements were taken in June through October. The soil moisture data obtained during this period is summarized in Table 1-A-1, along with a graphical representation of the data in Attachment 1-B. May 2005 was the wettest month of the year; therefore, the soil moisture measurements taken in June should reflect the effects of precipitation that occurred in May and earlier (provided all of the moisture within each cover is due to precipitation and not residual moisture from the cover construction process). Little to no precipitation fell during July and August. Therefore, the soil moisture measurements in September reflect the effects of this dry period (indicated by a decrease in moisture content within the cover). Slightly above normal precipitation occurred during September and October. Soil moisture measurements taken in October show the effects of entering into a wet period, after most of the vegetation on the covers had dried out. The graphs all show that soil moisture content (measured in percent) decreased from June to September, and increased slightly in October. The graphs show that percolating water from precipitation did not migrate deep past the subsurface layer (as evidenced by low moisture content below 1.4 meters or 4.5 feet), and therefore did not migrate into the contaminant layer.

Data in future years will further refine any trends regarding moisture penetration.

Table 1-A-1 Soil Moisture Data								
			NRF-21A		NRF-12B/14		NRF-19	
Date	Depth		Volumetric Water Content In Soil %		Volumetric Water Content In Soil %		Volumetric Water Content In Soil %	
	Feet	Meters	21A #1	21A #2	12B/14 #1	12B/14 #2	19 #1	19 #2
6/3/2005	0.7	0.2	18.34	20.32	18.16	20.00	17.68	20.03
	1.3	0.4	19.15	20.96	17.40	21.17	18.62	20.42
	2.0	0.6	17.51	19.15	17.51	20.91	20.73	20.83
	2.6	0.8	18.48	20.03	18.84	20.88	20.22	19.33
	3.3	1.0	20.36	20.18	20.69	21.49	19.30	19.43
	3.9	1.2	19.01	19.88	19.78	21.52	17.74	20.61
	4.6	1.4	17.20	13.39	19.74	21.48	19.03	18.54
	5.3	1.6	7.92	6.32	12.55	13.59	11.87	10.06
	5.9	1.8	5.27	4.69	5.60	7.34	6.45	6.42
	6.6	2.0	6.33	4.50	5.58	5.72	5.45	6.68
6/28/2005	0.7	0.2	17.67	18.92	16.27	18.06	15.67	17.35
	1.3	0.4	17.81	19.14	16.11	19.25	15.37	17.59
	2.0	0.6	17.44	18.73	17.22	18.71	18.07	17.90
	2.6	0.8	18.34	19.48	18.58	19.64	19.24	17.65
	3.3	1.0	20.54	20.92	19.61	20.49	18.49	18.92
	3.9	1.2	19.04	20.27	19.23	20.84	18.14	20.94
	4.6	1.4	18.25	13.80	19.45	20.80	19.34	18.96
	5.3	1.6	7.84	6.74	13.27	13.04	11.88	10.30
	5.9	1.8	5.64	4.73	5.15	7.09	6.67	6.35
	6.6	2.0	5.76	4.66	5.69	5.82	5.71	6.24
7/15/2005	0.7	0.2	14.40	13.61	12.49	13.30	12.78	14.22
	1.3	0.4	15.23	15.12	11.09	15.70	11.38	14.04
	2.0	0.6	15.77	15.88	12.89	16.54	13.26	15.80
	2.6	0.8	16.57	17.62	16.33	17.86	14.79	16.98
	3.3	1.0	20.15	19.06	18.64	19.21	14.91	17.54
	3.9	1.2	17.63	19.15	18.55	19.63	16.73	20.42
	4.6	1.4	16.87	13.10	18.43	19.48	18.79	17.66
	5.3	1.6	7.59	6.49	12.54	12.13	11.81	9.30
	5.9	1.8	5.28	4.23	5.15	6.66	6.37	6.06
	6.6	2.0	5.99	4.36	5.51	5.48	5.37	6.17
8/11/2005	0.7	0.2	12.26	12.28	11.06	11.64	11.03	13.04
	1.3	0.4	12.56	13.41	10.24	14.37	10.60	12.58
	2.0	0.6	12.20	13.42	11.44	14.71	12.82	13.53
	2.6	0.8	14.50	15.21	14.70	15.91	13.44	14.33
	3.3	1.0	18.88	18.07	18.13	18.30	13.69	16.59
	3.9	1.2	17.87	19.12	18.60	19.45	14.14	19.42
	4.6	1.4	17.23	13.21	18.89	19.18	15.49	17.69
	5.3	1.6	7.73	6.23	12.52	11.90	10.50	9.64
	5.9	1.8	5.39	4.75	5.36	6.89	6.16	5.97
	6.6	2.0	6.02	4.52	5.44	5.68	5.64	6.51

Table 1-A-1 Soil Moisture Data, Continued								
			NRF-21A		NRF-12B/14		NRF-19	
Date	Depth		Volumetric Water Content In Soil %		Volumetric Water Content In Soil %		Volumetric Water Content In Soil %	
	Feet	Meters	21A #1	21A #2	12B/14 #1	12B/14 #2	19 #1	19 #2
9/15/2005	0.7	0.2	11.38	11.49	10.10	10.81	10.06	11.74
	1.3	0.4	11.90	11.87	9.49	13.71	9.94	11.73
	2.0	0.6	11.50	11.91	10.32	14.34	11.75	12.46
	2.6	0.8	12.15	13.21	12.19	15.35	12.29	12.93
	3.3	1.0	15.17	15.66	14.21	16.65	12.08	14.22
	3.9	1.2	14.53	16.58	15.01	16.98	12.56	17.22
	4.6	1.4	14.36	11.70	16.20	17.17	12.80	16.16
	5.3	1.6	6.90	6.00	11.97	11.19	8.81	9.04
	5.9	1.8	5.21	4.27	4.98	6.35	5.32	5.90
	6.6	2.0	5.89	4.44	5.10	5.38	4.87	6.42
10/18/2005	0.7	0.2	12.14	11.70	10.24	11.01	10.06	12.34
	1.3	0.4	12.43	12.77	9.87	14.55	10.39	12.46
	2.0	0.6	11.41	13.16	11.04	15.14	12.26	12.70
	2.6	0.8	12.88	13.76	12.80	15.92	12.94	12.83
	3.3	1.0	15.95	16.53	14.60	16.94	12.99	15.01
	3.9	1.2	15.23	17.09	15.17	17.69	13.12	17.67
	4.6	1.4	14.84	12.51	16.46	18.47	14.54	17.11
	5.3	1.6	7.09	6.10	11.99	11.78	9.78	9.59
	5.9	1.8	5.66	4.63	5.32	6.90	5.79	6.08
	6.6	2.0	6.53	4.75	5.49	5.75	5.07	6.38

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